



Amendment Under 37 C.F.R. § 1.111
U.S. Application No. 10/529,152

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1.-20. (canceled).

21. (new): A method of etching a chromium-based thin film, the thin film comprising chromium, by use of a resist pattern placed thereon as a mask,
comprising:

supplying a plasma excitation power to a dry etching gas to excite plasma so that a chemical species is generated, said dry etching gas comprising halogen and oxygen, and
carrying out the etching of the thin film by use of the chemical species,

wherein the plasma excitation power is lower than a plasma excitation power at which a plasma density jump occurs so that verticalness of the sectional shape of the pattern formed on the thin film be enhanced.

22. (new): The method of etching a chromium-based thin film according to claim 21, wherein at least a part of the chemical species is supplied in the direction perpendicular to the thin film so that the resist layer which forms the resist pattern is etched to generate an organic substance, and

an etching selectivity S between a resist layer and the thin film is smaller than 1.5,
whereby S is defined as:

$$S = (\text{etching rate of the thin film} / \text{etching rate of the resist layer}) .$$

23. (new): The method of etching a chromium-based thin film according to claim 22, wherein at least a part of the chemical species is supplied in the direction perpendicular to the thin film by applying a high-frequency power.

24. (new): The method of etching a chromium-based thin film according to claim 23, wherein the resist layer which forms the resist pattern has a coverage of 70% or more of the thin film.

25. (new): The method of etching a chromium-based thin film according to claim 24, wherein the high-frequency power is applied so that an organic substance is deposited on a side wall of the resist pattern to be etched by an isotropic etching component generated during the etching.

26. (new): The method of etching a chromium-based thin film according to claim 25, wherein the halogen is chlorine.

27. (new): The method of etching a chromium-based thin film according to claim 26, wherein the dry etching gas further contains helium.

28. (new): The method of etching a chromium-based thin film according to claim 27, wherein the thin film is etched in presence of an organic substance other than that derived from the resist layer.

29. (new): The method of etching a chromium-based thin film according to claim 28, wherein the organic substance other than that derived from the resist layer comprises an organic gas which is introduced to the dry etching gas.

30. (new): The method of etching a chromium-based thin film according to claim 28, wherein an organic substance other than that derived from the resist layer comprises an organic polymer which is disposed in an etching chamber where etching is carried out.

31. (new): A method of etching a chromium-based thin film by processing an object comprising the chromium-based thin film containing chromium, by use of a resist pattern placed thereon as a mask,

comprising

supplying a plasma excitation power to a dry etching gas to excite plasma so that a chemical species is generated, said dry etching gas comprising halogen and oxygen, and

carrying out the etching of the thin film by use of the chemical species,

wherein:

the thin film is etched in presence of an organic substance other than that derived from a resist layer which forms the resist pattern.

32. (new): The method of etching a chromium-based thin film according to claim 31, wherein a resist layer which forms the resist pattern has a coverage smaller than 70% of the thin film.

33. (new): The method of etching a chromium-based thin film according to claim 32, wherein the organic substance comprises an organic gas which is introduced to the dry etching gas.

34. (new): The method of etching a chromium-based thin film according to claim 33, wherein the amount of the organic gas is 30 vol% or less of the dry etching gas.

35. (new): The method of etching a chromium-based thin film according to claim 34, wherein the organic gas comprises ethanol.

36. (new): The method of etching a chromium-based thin film according to claim 32, wherein an organic substance comprises an organic polymer which is disposed in an etching chamber where etching is carried out.

37. (new): The method of etching a chromium-based thin film according to claim 32, wherein the halogen is chlorine.

38. (new): The method of etching a chromium-based thin film according to claim 37, wherein the dry etching gas further contains helium.

39. (new): A method of manufacturing a photomask from a photomask blank comprising a transparent substrate and a light-shielding thin film formed on the transparent substrate, said thin film comprising chromium,

said method comprising etching the thin film by use of a resist pattern placed thereon as a mask,

said etching comprising:

supplying a plasma excitation power to a dry etching gas to excite plasma so that a chemical species is generated, said dry etching gas comprising a halogen and oxygen, and carrying out the etching of the thin film by use of the chemical species,

wherein the plasma excitation power is lower than a plasma excitation power at which a plasma density jump occurs, so that verticalness of the sectional shape of the pattern formed on the thin film be enhanced

40. (new): The method of manufacturing a photomask according to claim 39, wherein at least a part of the chemical species is supplied in the direction perpendicular to the thin film so that the resist layer which forms the resist pattern is etched to generate an organic substance, and an etching selectivity S between a resist layer and the thin film is smaller than 1.5, whereby S is defined as:

$$S = (\text{etching rate of the thin film} / \text{etching rate of the resist layer}) .$$

41. (new): The method of manufacturing a photomask according to claim 40, wherein, by etching the thin film, a pattern including an optical proximity correction (OPC) pattern is formed.

42. (new): The method of manufacturing a photomask according to claim 39, wherein, by etching the thin film, a pattern including a pattern of which a design size is $4\mu\text{m}$ or more and $2.0\mu\text{m}$ or less and of which a CD linearity error is 15nm or less is formed.

43. (new): A method of manufacturing a photomask from a photomask blank comprising a transparent substrate and a light-shielding thin film formed on the transparent substrate, said thin film comprising chromium,

said method comprising etching the thin film by use of a resist pattern placed thereon as a mask,

said etching comprising:

supplying a plasma excitation power to a dry etching gas to excite plasma so that a chemical species is generated, said dry etching gas comprising halogen and oxygen, and

carrying out the etching of the thin film by use of the chemical species,

wherein the thin film is etched in presence of an organic substance other than that derived from a resist layer which forms the resist pattern.